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Expert Group Meeting on Exchange of Experiences on Energy Conservation in Small and Medium Industries for ASEAN Countries

Kuala Lumpur, Malaysia, 5-7 December 1983

REPORT*

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INTRODUCTION

1. The Expert Group Meeting on Exchange of Experiences on Energy Conservation in Small and Medium Industries for ASEAN countries was convened on 5th - 7th December, 1983 in Kuala Lumpur, Malaysia.

2. This Meeting was jointly organised by the Ministry of Energy, Telecommunications and Posts, Malaysia, The United Nations Industrial Development Organisation (UNIDO) and the National Electricity Board of Malaysia.

3. The Meeting was attended by delegates from Indonesia, Singapore, Philippines, Thailand and Malaysia. The Energy Conservation Experts from Japan and UNIDO representatives were also in attendance. The list of delegates appear as Annex I.

4. The Meeting was officially opened by the Honourable Deputy Minister of Energy, Telecommunications and Posts, Malaysia, Datuk Haji Suhaimi bin Datuk Haji Kamaruddin. In his concluding remarks he stated that all ASEAN countries had already implemented various energy conservation measures with varying degrees of commitment and had attained varying degrees of success. The time was now ripe for all to reconcile individual efforts and concentrate collective resources under the ambit of ASEAN cooperation. This meeting should provide the platform to discuss and eleborate on the framework of this cooperation in the traditional spirit of ASEAN cooperation and cordiality.

ELECTION OF CHAIRMAN AND RAPPORTEURS

5. **Mr. Syed Mohd. Adlan** was elected Chairman of the meeting. The meeting also elected officials from the Ministry of Energy, Telecommunications and Posts, Malaysia to act as the rapporteurs.

ADOPTION OF AGENDA

6. The Meeting adopted the Agenda which appears as Annex II.

PRESENTATION AND DISCUSSION ON COUNTRY PAPERS

PHILIPPINES

The country representative presented his country paper and in his concluding remarks made some proposals towards further ASEAN Cooperation in Energy as follows:-

1. The formation of an Energy Management Association in each member ASEAN country.

2. Formation of an Association of ASEAN Energy Management with the objective of strengthening ASEAN Cooperation on Energy Conservation. This Association could undertake the following activities:-

   a) publication of a monthly/quarterly newsletter to serve as a medium of exchange of information among ASEAN members on energy conservation experiences, new technologies, problems and proposals for improvement, recent developments etc.

b) to hold annual seminar/meeting/workshop pertaining to ASEAN energy issues with complimentary exhibition on new energy management products.

In the discussions that followed, Thailand sought further information on the Energy Management Association of the Philippines. The Philippines representative explained that the Association is a private organisation working closely with the Government. To be a member of the Association, one had to be a graduate of a course in basic energy management conducted by the Bureau of Energy Utilization.

Malaysia inquired on how tax credit was being implemented in the Philippines and was informed that the energy-efficient equipments are manufactured locally and given duty free status.

The representative from Indonesia asked how energy audit has been controlled by the Government, who undertakes the energy audit and whether energy audit had become an effective tool towards energy conservation. The Philippines representative responded that the law required companies consuming more than 2 million litres of fuel to submit plans and report on energy consumption to the Government on a quarterly basis. Energy Audit had been conducted by trained energy managers or members of the Association. Publications explaining the method of conducting Energy Audit are also being circulated.

The Thai delegate commented that generally small and medium sized industries are not aware of the importance of energy conservation. In this regard he asked how such awareness can be created. The representative replied there are awareness campaigns, seminars, education and information dissemination towards enhancing awareness in energy conservation.

The UNIDO representative requested information on activities that would be undertaken by the proposed ASEAN Energy Management Association. The Philippines representative explained that the activities envisaged would be to publish and circulate a newsletter on experiences on energy conservation among the ASEAN member countries and also to jointly organise exhibitions and to conduct technical training.

SINGAPORE

The representative from Singapore presented his country paper on the energy situation, energy conservation policy and the main energy conservation measures that have been implemented. This was followed by a presentation of case studies in energy conservation in an industrial gas manufacturer and in a shipyard.

In regard to the government exempting energy-efficient industries from the 10% income tax, the Malaysian delegate requested to be informed of the basis for measuring the efficiency in energy usage. The representative replied that a number of criteria have been used to evaluate the efficiency of energy usage, amongst which would be investment incurred by the company in introducing new energy conservation equipment in the factory and the amount of energy used per unit of output.

With regard to the Energy Conservation Centre in the Public Utilities Board, a delegate from Malaysia sought information on the financing and management of the Centre as well as the provision of services to private industries in energy auditing. In addition he enquired into the effectiveness of the Centre in providing manpower training. The representative explained that the Energy Conservation Centre in Singapore was in fact an exhibition centre and it was the Energy Conservation Division in the Public Utilities Board which functioned in a manner similar to the Energy Conservation Centre in Japan or the Bureau of Energy Utilisation of the Philippines. The Energy Conservation Centre served as an information centre attempting to put across to the consumers the meaning of energy

conservation, particularly on how to save electricity in homes and work places. On the issue of operation and financing, the representative stated that the Centre is operated, financed and run solely by the Public Utilities Board. The Centre conducted audits on requests and does not charge fees for services provided.

The Indonesian delegate inquired on how the success of the energy conservation training programmes was measured, the kind of energy audits that have been conducted to date and whether there are laws on energy utilisation in Singapore. The representative stated that the government had not made it mandatory for heavy energy consumers to appoint energy managers as in the case of the Philippines. However, all new buildings have to comply with building regulations, for instance the "Overall Thermal Transfer Value" (OTTV) cannot be greater than a stipulated value which restricts the amount of solar heat gain into the building envelope. There are also guidelines on lighting and air-conditioning design for new buildings.

The representative explained that the effectiveness of the training courses could be measured by the number of successful participants. To date the Energy Conservation Division had organised jointly with the Nanyang Technological Institute two courses at the engineers/managers level and with the Singapore Polytechnic, one course at the technician level. The Centre had decided upon joint organisation of the courses for two reasons, namely to indirectly cultivate consciousness of energy conservation in institutes of higher learning and the other based on the reasoning that a certificate from an institute of higher learning would be more significant than one from the Public Utilities Board.

The representative further added that since the surveys are being conducted free of charge, there have been understandably many requests from all sectors of the economy except for the oil companies who already have their own energy conservation experts. During the survey, the first visit to the factory allowed the engineer from the Centre to have some idea of the process involved in the factory which depended on the product mix and the type of equipment. The second visit involved a technical audit, the procedures of which are similar to the procedures given in the UNIDO "Guidebook" which had been distributed among the participants.

On the enquiry from Indonesia on whether building regulations are compulsory, the representative informed that before a building can be put up or altered, approval from the relevant authorities must be obtained.

The Malaysian delegate commented that most hotels in Singapore use the "key tag system" and inquired on the savings achieved by hotels through having such a system. The representative replied that based on a survey undertaken on hotels, as much as 30% of the energy consumption of hotel rooms could be saved using the "key tag system".

The representative from UNIDO enquired as to the kind of cooperation among ASEAN countries in industrial energy conservation that is envisaged by Singapore in the future. The representative suggested that ASEAN workshops on specific industry groups be organised with the objective of exchange of information as well as to encourage greater cooperation in energy conservation among the ASEAN countries.

THAILAND

Following the presentation by Thailand, a Malaysian delegate raised the question on the short training courses given to plant managers by the Energy Conservation Center of Thailand. The Thai representative stated that basically, it concentrated on teaching the plant managers in using various equipment to carry out simple energy audits by themselves. On completion of these short courses, the plant managers are given a certificate of attendance.

To the question from Singapore as to how the Industrial Finance Corporation of Thailand evaluated potential candidates for loans to upgrade their factory to be more energy-efficient, the representative informed that the criteria used was that the factory had to be energy-intensive, the products would have to be export-orientated and in addition should have good import substitution potentials.

In response to the question by Malaysia on how to create awareness in the Factory Management on the benefits of energy audit, the Thai delegate explained that the Energy Conservation Center sent out monthly newletters to the factories regarding energy conservation. This Center also published results on actual case studies. Experts from the Center also made frequent visits to factories to introduce simple ways in undertaking energy audits.

On the question from Indonesia on how to determine the potential for savings, the representative informed that it was being done mainly through energy audits and they have undertaken a study financed by the UNDP on the three major energy consuming sectors, namely the transportation, electricity generation and the manufacturing sectors.

Responding to an enquiry from Malaysia on tax incentives in which energy-efficient equipment are only taxed 10% of its CIF value, the Thai delegate explained that a Technical Committee consisting of members from the Government, Industries and Academic sectors were responsible for evaluating and listing the types of equipment that would qualify for this exemption. To a further enquiry from Malaysia on the proposed Industrial Energy Conservation Centre (ICT) the Thai delegate informed the Meeting that Thailand will be setting up the ICT to undertake various schemes and programmes of industrial energy conservation. This Centre will be a non-governmental institution operating under close supervision and guidelines of the National Energy Authority. The government will provide an initial amount of US $2.0 million for this centre.

The Thai delegate added that the large corporations are expected to contribute financially and technically to the running of ICT. The Thai delegate explained that the ICT should be at least partially self-financed and should not depend wholly on the government.

INDONESIA

The representative from Indonesia presented the country paper. The delegate from Malaysia enquired as to whether there was a machinery responsible for energy conservation in Indonesia and if so, which was the ministry or agency responsible for its administration. The representative from Indonesia replied that there is a committee on energy conservation but there did not exist at this stage a permanent institution responsible for energy conservation.

With regard to the work done in energy conservation by French consultants in Indonesia, Malaysia sought further information on the exact nature of the works and the particular Indonesian agency which engaged them. The representative from Indonesia stated that under technical assistance provided by the French Government, preliminary energy auditing had been conducted in Indonesia.

The purpose was to identify areas of potential energy conservation. It was found that with good house keeping a 5-10% of energy consumption could be reduced while significant efforts could reduce consumption by 30%. The consultants had been engaged by the Department of Mines and Energy, Indonesia. The consultants selected seven companies in the industrial sector and two in the transportation sector.

MALAYSIA

The meeting took note of the papers presented by the Malaysian representative.

The deliberation of the report was conducted in 2 parts. The first part touched on energy conservation in Malaysia, and the second, on the report on the energy survey conducted on small and medium scale industries in Malaysia.

GENERAL DISCUSSION

In winding up the day's discussion, the participants were invited by the Chairman for further comments. In response, the Japanese experts directed a question to the Philippines as to who undertakes the energy audit in Philippines. The Philippine representative informed that energy audit had been normally carried out by the Bureau of Energy Utilization, Energy Management Association of the Philippine and private consulting companies. On the question of types of instrument used in energy audit, the Philippine representative replied that the equipment used are standard instruments from Japan, United Kingdom and United States of America.

As a means towards further ASEAN cooperation, the Philippine expressed willingness to extend assistance to member countries in the field of energy conservation. The representatives from Thailand noted with interest energy conservation measures in buildings as applied in Singapore. He hoped that the experiences could be shared and eventually a similar system could be considered for application in Thailand.

The meeting noted that the experiences of the ASEAN countries could be mutually beneficial. Thought has to be given to evolve a mechanism whereby ASEAN cooperation in this field can be put on a formal footing.

PRESENTATION AND DISCUSSION ON ENERGY CONSERVATION GUIDEBOOK

Following the presentation of the Energy Conservation Guidebook by the Japanese Experts, the delegate from Malaysia commented that during energy audits conducted by the Project Team, in the factories, heat losses in the flue gas from stacks was computed merely by measuring the excess oxygen content. In this respect he inquired as to the reason why the energy survey forms distributed by Thailand incorporated measures for carbon monoxide and carbon dioxide in addition to oxygen, and whether it was necessary to take measurements of gases other than oxygen. The Japanese expert explained that to obtain precise figures for heat loss in the flue gas, measurements of the different gases present would be necessary. However, in order to obtain an estimate of the amount of heat loss, it would suffice to measure either oxygen or carbon dioxide contents. A delegate from Indonesia enquired whether it was possible to break down an energy audit into a primary stage and a detailed stage. The delegate from Thailand responded by informing the meeting that in their own experience, the very first stage was to try and convince top management of factories to study their energy bills and compare their energy costs with those of other similar factories. Further steps of an energy audit would involve checking of furnace, checking of steam leakage and proper insulation.

A Malaysian delegate made the following comments on the contents of the Guidebook:

> It is not necessary to have detail description of measuring instruments. A listing of the required instruments would suffice.

More tabulated guidelines, practical pointers and check charts should be included for easy reference for the factory engineers and managers. The Guidebook should elaborate methods of reducing oxygen contents of flue gas for different types of boilers.

The Philippines delegate suggested that a list of traditional instruments that could be used for the measurement of various parameters also be included in the annex of the report.

The representative of Thailand stated that the Guidebook will be very helpful to the engineers and technicians in carrying out energy surveys in the factory.

The representative from UNIDO stated that the Guidebook cannot be expected to be perfect at this stage as it is only the first edition. However the feedback from the readers would be noted and suggestions would be considered in future revision of the Guidebook.

DISCUSSION AND IDENTIFICATION OF APPROPRIATE ENERGY CONSERVATION TECHNOLOGY FOR ASEAN COUNTRIES

Prior to discussion on recommendation of possible ASEAN cooperation programmes, the MITI representative explained on Japan's energy conservation policies and measures.

After discussion of possible ASEAN cooperation programmes the meeting identified three projects which could be further explored by UNIDO. The three projects are on:

a) ASEAN network on energy management in industries

b) Training of energy conservation personnel and

c) Technology transfer on converting techniques of oil-fired plants to gas-fired or coal-fired plants, as detailed in Annex IV.

ACKNOWLEDGEMENT OF THANKS

The Chairman thanked the participants for their contribution to the meeting. The participants thanked the organisers of the meeting and the Ministry of International Trade and Industry, Japan.

ANNEX I

LIST OF PARTICIPANTS

Country/Org.		Name	Designation
INDONESIA	1.	Mr. Irzal Neor Chatab	Directorate General of Power Department of Mines & Energy P.O. Box 3043/JKT Phone: 323607
	2.	Mr. J.M.P. Ohello	Chief, Sub Director of Metal Transportation and Services, Ministry of Industry Directorate General of Small Industry Jalan Gatot Subroto Kav. 52-53 P.O. Box 3547/JKT Phone: 515509, 515526, 515546 Ext. 2643
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JAPAN	4.	Mr. Hidetoshi Hayakawa	Chief of Technology Section, Ministry of International Trade and Industry, Japan 1-3-1 Kasumigaseki Chiyoda-ku, Tokyo Phone: 03-501-9726
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Country/Org.		Name	Designation
	6.	Mr. Masataka Eguchi	Guidance Manager, Counterpart of UNIDO, Energy Conservation Center Japan
	7.	Mr. Ryoji Takahashi	Adviser, Counterpart of UNIDO, Energy Conservation Center Japan
	8.	Mr. Toshio Sugimoto	Manager, Counterpart of UNIDO, Energy Conservation Center Japan
MALAYSIA	9.	Mr. Ahmad Faizul Shamsuddin	Research Engineer, Research and Development Department, National Electricity Board of Malaya, Phone: 445566 Ext. 441
	10.	Mr. Alizan bin Abdul Manan	Planning Engineer, Ministry of Energy, Telecommunications and Posts, Wisma Damansara, Jalan Semantan, Kuala Lumpur Phone: 946677
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	13.	Mr. Syed Md. Adlan	Head Energy Unit, Ministry of Energy, Telecommunications and Posts, Wisma Damansara, Jalan Semantan Kuala Lumpur Phone: 946677
	14.	Mr. Yap Mew Sang	Federation of Manufacturers Malaysia

Country/Org.		Name	Designation
PHILIPPINES	15.	Mr. Gregonio S. Gonzales, Jr.	President, Energy Management Association of the Philippines, c/o PNB, Escolta Manila, Phils.
	16.	Ms. Marilou M. Calzado	Manager, Productivity & Development Center Development Academy of The Philippines P.O. Box 74, Araneta Center CUBAO. Q.C. Philippines Phone: 6735215
SINGAPORE	17.	Mr. Goh Yeow Tin	Division Director, Singapore Manufacturers' Association 1 Maritime Square #02-18 World Trade Centre, Singapore 0409 Phone: 2785211
	18.	Mr. Koh Kah Aik	Head, Public Utilities Board Somerset Road, Singapore 0923, Phone: 2358888
THAILAND	19.	Mr. Anonda Poshakrishna	Industrial Finance Coporation of Thailand, 1770 New Petchaburi Road, Bangkok, Thailand
	20.	Mr. Chakramon Phasukavanich	Industrial Planning Chief Economic Project Division, National Economic and Social Development Board, Bangkok, Thailand
	21.	Mr. Tammachart Sirivadhanakul	Deputy Secretary General, National Energy Administration Ministry of Science, Technology and Energy, Rama 1 Road, Bangkok 10500, Thailand
UNIDO	22.	Dr. H.W. Pack	Senior Officer, UNIDO, P.O. Box 300, Vienna, Austria.

	Name	Designation
OBSERVERS		
1.	Mr. Abu Bakar bin Ismail	Management Executive PETRONAS Building P.O. Box 2444 No. 136, Jalan Pudu Kuala Lumpur
2.	Mr. Ahmad Nordeen Salleh	Section Head, Gas Development Department, PETRONAS
3.	Mr. Lim Chin Kee	Federation of Manufacturers Malaysia
4.	Dr. Rahim Bidin	Pusat Penyelidikan Piawaian Malaysia, Shah Alam, Selangor
RAPPORTEURS		
1.	Mr. Au Leck Chai	Ministry of Energy, Telecommunications and Posts Phone: 946677
2.	Mr. Chin Shih Loon	Assistant Secretary, Ministry of Energy Telecommunications and Posts. Phone: 946677
3.	Mr. Letchumanan	Ministry of Energy, Telecommunications and Posts. Phone: 946677
4.	Mr. Mohamat Omar	Ministry of Energy, Telecommunications and Posts. Phone: 946677
5.	Ms. Noraini Hashim	Research Officer, Ministry of Energy, Telecommunications and Posts. Phone: 946677

ANNEX II

AGENDA

Monday 5th December

8.00 a.m. - 9.00 a.m.	-	Registration of participants at Merlin Hotel
9.00 a.m. - 2.00 p.m.	-	Visit to Marco Shoes Sdn. Bhd., Port Kelang

Tuesday 6th December

	-	Opening Ceremony
8.00 a.m. - 8.30 a.m.	-	Arrival of Delegates
8.30 a.m. - 8.45 a.m.	-	Arrival of invited guests
8.45 a.m. - 9.00 a.m.	-	Delegates and invited guests take their seats
9.00 a.m.	-	Arrival of the Hon. Deputy Minister of Energy, Telecommunications and Posts, Malaysia Y.B. Datuk Haji Suhaimi bin Datuk Haji Kamaruddin
	-	Address by the Representative of UNIDO by Dr. H.W. Pack
	-	Address by Representative of Ministry of International Trade and Industry, Japan by Mr. K. Kondo
	-	Address by UNDP Resident Representative Mr. Y.Y. Kim
	-	Address and official opening by the Hon. Deputy Minister of Energy, Telecommunications and Posts, Malaysia
10.00 a.m.	-	The Hon. Deputy Minister, invited guests, delegates and observers are cordially invited to the exhibition and refreshments corners
10.00 a.m. - 10.30 a.m.	-	Exhibition/Refreshments
10.30 a.m. - 10.35 a.m.	-	Election of Chairman and Rapporteurs
10.35 a.m. - 12.45 p.m.	-	Presentation of Country Papers and Discussion: Philippines, Singapore and Thailand
12.45 p.m. - 2.00 p.m.	-	Lunch
2.00 p.m. - 3.30 p.m.	-	Presentation of Country Papers and Discussion: Indonesia and Malaysia
3.30 p.m. - 3.45 p.m.	-	Refreshments

3.45 p.m. - 5.00 p.m.	-	Group Discussion on Country Papers
8.30 p.m.	-	Dinner hosted by the Hon. Deputy Minister of Energy, Telecommunications and Posts, Malaysia (at the Lotus Room, Merlin)

Wednesday 7th December

9.00 a.m. - 10.30 a.m.	-	Presentation and Discussion of Energy Conservation Guidebook
10.30 a.m. - 10.45 a.m.	-	Refreshments
10.45 a.m. - 12.45 p.m.	-	Presentation and Discussion of Energy Conservation Guidebook
12.45 p.m. - 2.00 p.m.	-	Lunch
2.00 p.m. - 3.30 p.m.	-	Discussion and Identification of Appropriate Energy Conservation Technology for ASEAN Countries
3.30 p.m. - 3.45 p.m.	-	Refreshments
3.45 p.m. - 5.00 p.m.	-	Consideration and adoption of draft report

ANNEX III

LIST OF DOCUMENTS

1. Aide - Memoire
2. Energy Conservation in The Philippines (ID/WG.417/7)
3. Energy Conservation in Singapore (ID/WG.417/3)
4. Energy Conservation in Thailand (ID/WG.417/1)
5. Industrial Energy Conservation Policies and Measures: A case of Thailand (ID/WG.417/2)
6. Energy Conservation in Thai Industries (ID/WG.417/4)
7. Energy Conservation in Indonesia (ID/WG.417/6)
8. Energy Conservation in Malaysia (ID/WG.417/5)
9. Guide Book for the Factory Engineers on Energy Conservation Diagnosis (UNIDO/IS.449)
10. Report on the Meeting on Energy Conservation in Small and Medium Industries (UNIDO/IS.443)

ANNEX IV

PROJECT I : ASEAN NETWORK ON ENERGY MANAGEMENT IN INDUSTRY

1. Formation and Appointment of National Focal point

2. Meeting of Heads/Officer-in-Charge of National Focal points

   a) ASEAN Secretariat Formation

   b) Formulation of work programmes based on common interests

   c) Specify - Activities
      General - 5 years
      Specific/Initial - 2 years

   d) Form Committees within ASEAN Secretariat

      i) Training and Education
      ii) Technical (T.T./R & D/Advisory)
      iii) Finance & Administration

   e) ASEAN Secretariat Functions:

      Information Centre

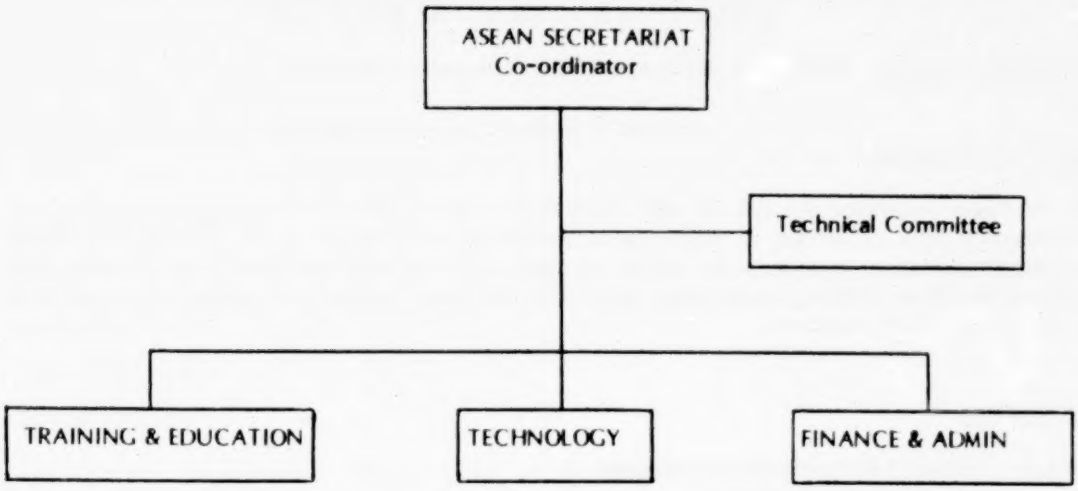
      Newsletter - Editorial Staff

      Seminars, Workshops

      Conventions

      Exhibitions

      Survey of Country Requirements particularly technology, R & D, Education and Training etc.



Information Activities

Seminars	New Technologies	Sources of Financing
Workshops	Survey of Technical Requirements	Budget
Plant visits	Technical Assistance Program	Accounting of funds
	Advisory Services	

Initial Activities

A. Formation of National Focal Point

B. 1) Survey of technical requirements of ASEAN members (training, R & D, education, expertise inadequacy)

2) Survey of technical expertise of ASEAN members (Expert Roster)

3) Information Exchange System (Newsletter, etc.)

4) Collation/Matching of 1) and 2) to establish sufficiency/adequacy (outside ASEAN technology or expertise, if inadequate)

PROJECT 2 : TRAINING OF ENERGY CONSERVATION PERSONNEL

Participating countries: Philippines, Singapore, Thailand, Malaysia, Indonesia

Background information

Since all Asean countries are lack of skilled engineers and technicians on energy conservation at factory-level, it is a good idea to hold regular workshops for trainers which may also accelerate awareness on energy conservation to factory managers. For example the Philippines is already well established in regular training programmes since 1978, we should utilize such opportunity, extending participation to ASEAN members.

Implementation:

Step 1: select 1 industrial sector each time.

Step 2: select participants (most probably from Energy Conservation Centres/Associations or professional associations etc.)

Step 3: formulate training programmes which includes classroom lessons as well as learning through factory-level surveys.

Step 4: a team consisting of International experts and ASEAN participants, will conduct a survey on selected factories of ASEAN countries in agreed industrial sectors with measuring instruments i.e. primary auditing of energy conservation. Through this exercise, trainers not only learn energy conservation techniques but also can compare different schemes in different countries. At the same time, this exercise will promote awareness on energy conservation to top factory management.

Consequently more efficient techniques will be transferred from Japan or other developed countries to ASEAN countries. When the trainers return home, they inform and brainstorm factory managers on the importance and effectiveness of energy conservation in SMI.

It may be a good idea to include energy policymakers as participants time to time so that they can learn and compare different energy conservation policies and formulate their own energy conservation policies.

Step 5: ASEAN Newsletter on Energy Conservation.
Since the Philippines is already publishing a regular newsletter at national-level, it may be possible to include ASEAN news on the subject for circulation among ASEAN members.

PROJECT 3 : TECHNOLOGY TRANSFER ON CONVERTING TECHNIQUES OF THE OIL FIRED PLANTS TO GAS OR COAL FIRED PLANTS

Participating countries: Malaysia, Indonesia, Thailand, Philippines.

Background information:

At least 3 countries of ASEAN have so far found large volumes of natural gas and would like to utilize it on industry, possibly replacing oil fired plants with gas fired plants as far as possible, for example iron-plants.

Implementation:

Step 1: a preliminary survey team which consists of International experts, Malaysian, Indonesian and Thai counterparts, will study and survey the possible area of replacement from existing oil firing to gas firing in industries, assessing technology as well as economic aspects.

Step 2: the survey team should visit Advanced countries in order to see utilization of gas in industries.

Step 3: a preparatory meeting for detailed survey.

Step 4: a detailed study on replacement plan for selected small industries.

Step 5: implementation.